THE DOE RUN COMPANY
SMELTING DIVISION

James M. Lanzafame
Environmental Manager

July 30, 2001

Mr. Tony Petruska
USEPA, Region VII
901 N 5th Street
Kansas City, KS 66101

Mr. Dave Mosby
MDNR, Superfund Section
P. O. Box 176
Jefferson City, Missouri 65102

Re: State of Work – Appendix A - I.1.E.i. "Long-term Monitoring and Maintenance Plan for Lead Redeposition"

Dear Sirs,

Enclosed you will find a copy of the "Long-term Monitoring and Maintenance Plan for Lead Redeposition" for your review as outlined in the Statement of Work.

We look forward to hearing from you concerning your approval of the above plan. You may reach me as always at 636-933-3143.

Sincerely,

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Environmental Manager


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Long-Term Monitoring and Maintenance Plan: Lead Deposition

Section A Introduction

The Doe Run Company is submitting this plan as required by a USEPA Administrative Order. Statement of Work – Appendix A I.1.C.i of that order requires, a "long-term monitoring and maintenance plan for lead deposition in the area. The purpose of this plan shall be to identify re-contaminated areas and prevent these areas from becoming health concerns." This plan addresses the requirement and provides a plan for the activities involved. The Administrative Order also requires "dispersion modeling to determine the lead deposition rates and likely areas of re-contamination" be a part of that plan.

Section B Areas of Soil Replacement

Between 1991 and 1999, the Doe Run Company has replaced the soil in approximately 120 residential yards. Some of these locations of these yards relative to the Old Main Stack are shown in Figure 1 and are listed in Table 1. Table 1 is sorted by address. . For each yard, Table 1 lists the address, year the soil was replaced, coordinates in both latitude/longitude and UTM co-ordinates and elevation. Locations were identified on postal maps and then transferred to a USGS map to obtain UTM coordinates. Elevations of the residences have been approximated using the USGS elevation contours. All of the soil replacement yards are within 800 meters of the main stack and are no further west than 500 meters from the main stack.

In addition, the Administrative Order requires Doe Run to evaluate and potentially replace soils in other yards within 0.4 miles of the smelter and also to evaluate and potentially replace soils at further distances. As soil replacement occurs, these new properties will be added to the spreadsheet. An important factor in this analysis will be the mean soil lead concentration of the soil used for replacement. This factor will be measured and entered in the spreadsheet for each yard replaced. An analysis of the available data indicates that the clean soil used for replacement averaged 14 ppm of lead.

Section C Soil Lead Measurements

The Administrative Order requires measurements, within four years, of the soil lead concentrations in yards that have had their soil replaced. These measurements should begin with the previously replaced yards. The yards that will have their soil replaced in the next eighteen months will be measured at four years from the date of replacement. The method of sampling will be identical to the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) that will be used for the Community Soil Cleanup Plan sampling. Every third yard within the predicted area of re-contamination above the then current health concern will be sampled. In addition, the specific gravity of the soil samples will be measured; i.e. the grams per square centimeter of un-compacted soil.

This measurement is necessary for translating deposition into soil concentrations (see below).

The results of the sampling of yards with soil replacement will be analyzed for re-contamination. The analysis will, after subtracting the initial lead concentration of the replaced soil, divide the measured concentration by the number of years of soil replacement. This will provide an estimate of the yearly accumulation of lead in the soil. This is just an estimate because the emissions from the smelter have been reduced several times over the era from 1991 and continued reductions are scheduled to occur. Thus, the total concentration is the result of deposition at various yearly rates. An estimate of yearly deposition expected on a continuing basis will be the result of this analysis. Deposition rates are a function of distance and direction from the smelter. This estimate, of expected yearly deposition rates, will be presented as a map of isopleths.

The necessity for a maintenance action will be based on the measured concentrations in the soil and the estimate of expected yearly deposition rates at the most recently evaluated rates from above when compared against the current re-contamination level of concern. The maintenance action could take several forms depending on the situation for each yard. When a yard is slated for maintenance action, a vertical profile of lead concentration will be sampled to determine if the lead is: a) on the surface only, b) in the first inch of soil, c) in the first six inches of soil, or d) throughout the previous replacement depth. The maintenance action will then be limited to the depth of any re-contamination.

Section D Modeling of Lead Deposition

The Administrative Order requires that dispersion modeling be performed to assist in the evaluation of any re-contamination of replaced soils. The modeling would be performed on the basis of actual emissions from the smelter over the period from 1991 to the present. Emissions inventories would be compiled to represent the emissions in each year, but the modeling could be performed for distinct eras when the emissions were relatively constant from year to year. The model ISCST will be used to perform the modeling analysis because of its current approved status and because the models proposed to replace ISC have not been configured or tested to perform deposition modeling. The starting point for development of the source emissions and characterization will be the modeling performed with ISCST for the State Implementation Plan (SIP). All changes in emission rate or source characteristics will be detailed in the modeling report. A major input item for deposition modeling is the particle size distribution of each emission source.

Deposition of lead will be calculated using ISCST3 for dry deposition. Two 2 years of meteorological data (the annual periods are April 1997 - March 1998 and April 1998 – March 1999) are available from the SIP. Both years of meteorological data will be applied to each year of emissions data and the higher deposition rate selected for the

remainder of the analysis. The second set of meteorology generally yields higher deposition rates.

The deposition modeling results for each yard, over the years since soil replacement, will be presented and compared to the measured soil lead concentrations. Deposition rates are provided by the model in grams per square meter of surface area per year. Translating these rates of deposition into lead concentrations in the soil is a complex evaluation. Since lead is deposited on the surface of the yard, the character of the surface is very important in determining its fate. For instance, if the surface is hardpan, the lead may be re-entrained into the air rapidly or washed off by the next rainfall. The deposited lead must be mixed into the soil before a concentration increase could be measured.

Prior soil sampling included a measurement of the soil density that averaged 1.48 grams/cubic centimeter. The calculation takes the rate of deposition from the modeling (for example 13 grams/m^2/year) and adds that lead to the weight of soil in the depth of the sample. The result (for example 58 ppm per year of lead in 6 inch deep soil sample) assumes that each year's deposition is thoroughly mixed into the entire depth of the soil.

A comparison of the predicted deposition rates to the concentrations measured on the yards can then be made. If the comparison is not accurate adjustments will be made to the model parameters that are responsible for the inaccuracies. When the model results are reasonably consistent with the measured data the model can be used to predict deposition and soil accumulation of lead at different locations and for future years. Changes in emissions or source characterization can be made to reduce the impact of those emissions on future deposition. Maintenance actions will be based, however, on measurements alone.

Illustration of Remediated Yards Relative to The Doe Run Main Stack

Map of Remediated Yards in Herculaneum

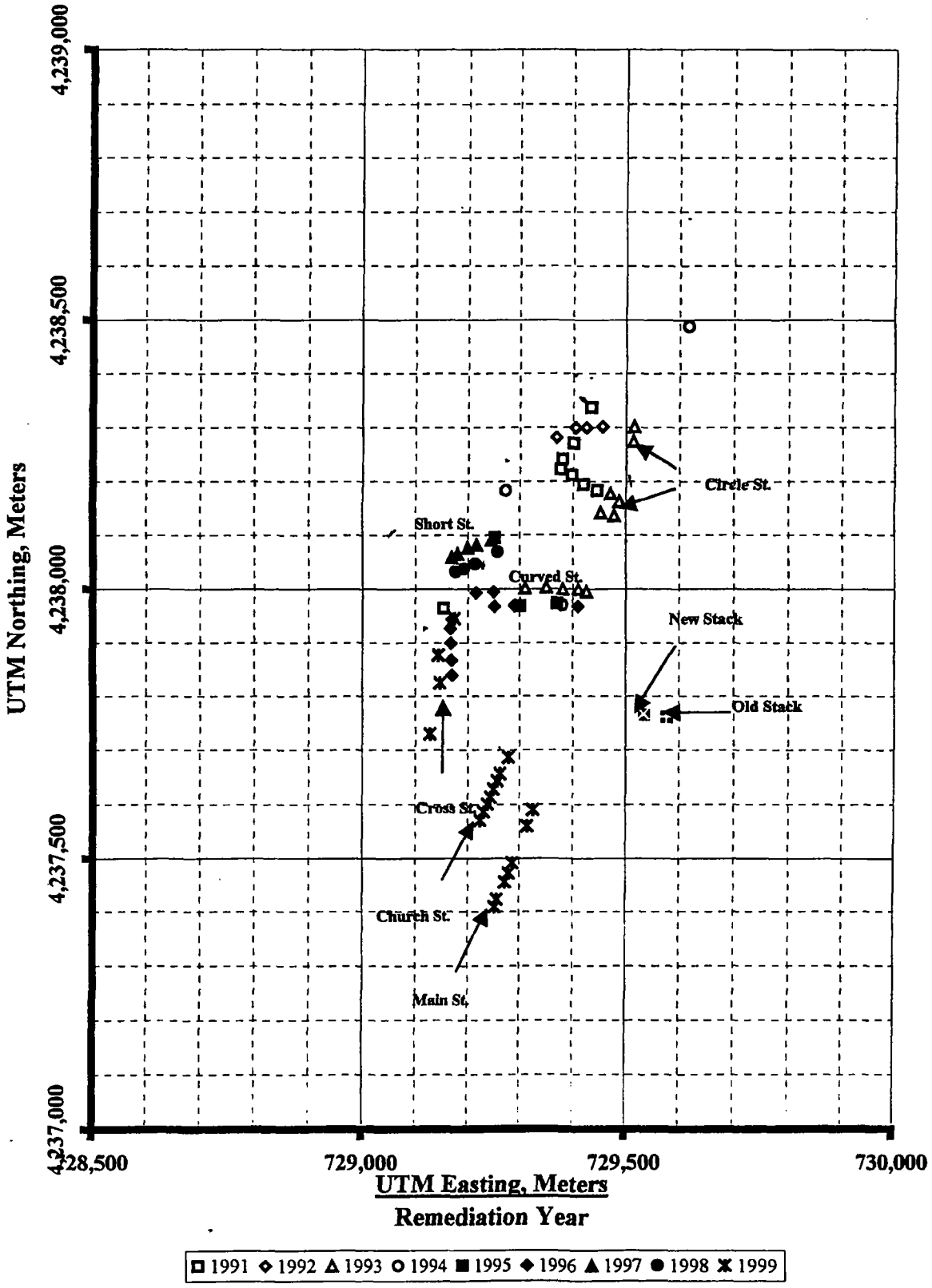

Table 1: Location and Elevation of Yards with Soil Replacement
(Sort by Address)

Address	Year Remediated	W Longitude 90°+Minutes	N latitude 38°+Minutes	UTM Coordinates, m Easting, m	UTM Coordinates, m Northing, m	Estimated Elevation ft	Estimated Elevation m
Main Stack		**22.575**	**15.648**	**729,534**	**4,237,767**		
717 Barclay	1991	22.672	15.958	729,393	4,238,341	440	134
910 Church	1999	22.790	15.591	729,221	4,237,661	438	134
916 Church	1999	22.794	15.584	729,215	4,237,648	440	134
922 Church	1999	22.799	15.576	729,208	4,237,633	441	134
928 Church	1999	22.803	15.568	729,202	4,237,618	442	135
934 Church	1999	22.807	15.561	729,196	4,237,605	443	135
940 Church	1999	22.812	15.553	729,189	4,237,590	444	135
946 Church	1999	22.817	15.545	729,181	4,237,575	445	136
710 Circle	1993	22.618	15.924	729,471	4,238,278	472	144
711 Circle	1993	22.617	15.939	729,473	4,238,306	470	143
721 Circle	1992	22.658	15.939	729,413	4,238,306	462	141
733 Circle	1992	22.679	15.938	729,382	4,238,304	462	141
737 Circle	1992	22.693	15.938	729,362	4,238,304	457	139
740 Circle	1991	22.695	15.922	729,359	4,238,275	450	137
745 Circle	1992	22.718	15.928	729,326	4,238,286	450	137
748 Circle	1991	22.710	15.906	729,337	4,238,245	445	136
752 Circle	1991	22.712	15.896	729,334	4,238,226	445	136
764 Circle	1991	22.697	15.890	729,356	4,238,215	447	136
774 Circle	1991	22.682	15.881	729,378	4,238,199	448	137
778 Circle	1991	22.664	15.875	729,404	4,238,188	450	137
784 Circle	1993	22.647	15.872	729,429	4,238,182	462	141
785 Circle	1993	22.659	15.853	729,412	4,238,147	458	140
788 Circle	1993	22.636	15.864	729,445	4,238,167	471	144
789 Circle	1993	22.642	15.850	729,436	4,238,141	468	143
802 Cross	1996	22.857	15.737	729,123	4,237,931	450	137
808 Cross	1996	22.856	15.722	729,125	4,237,904	450	137
811 Cross	1999	22.872	15.710	729,101	4,237,881	449	137
814 Cross	1996	22.855	15.705	729,126	4,237,872	450	137
820 Cross	1996	22.854	15.690	729,127	4,237,844	450	137
827 Cross	1999	22.870	15.682	729,104	4,237,829	450	137
315 Curved	1993	22.678	15.774	729,384	4,238,000	460	140
320 Curved	1996	22.689	15.759	729,368	4,237,972	465	142
321 Curved	1993	22.689	15.776	729,368	4,238,004	453	138
328 Curved	1994	22.709	15.760	729,339	4,237,974	458	140
333 Curved	1993	22.709	15.776	729,339	4,238,004	453	138
334 Curved	1995	22.716	15.762	729,328	4,237,978	458	140
339 Curved	1993	22.731	15.778	729,307	4,238,008	453	138
345 Curved	1993	22.758	15.777	729,267	4,238,006	455	139
352 Curved	1995	22.764	15.759	729,259	4,237,972	458	140
362 Curved	1996	22.771	15.760	729,248	4,237,974	458	140
367 Curved	1996	22.800	15.774	729,206	4,238,000	455	139
368 Curved	1996	22.798	15.759	729,209	4,237,972	458	140
381 Curved	1996	22.823	15.773	729,173	4,237,998	455	139

Table 1: Location and Elevation of Yards with Soil Replacement cont.

388	Curved	1996	22.854	15.746	729,127	4,237,948	455	139
391	Curved	1991	22.865	15.757	729,111	4,237,969	450	137
392	Curved	1999	22.851	15.747	729,132	4,237,950	450	137
607	Main	1994	22.547	16.039	729,575	4,238,492	510	155
937	Main	1999	22.747	15.555	729,283	4,237,594	435	133
947	Main	1999	22.755	15.539	729,272	4,237,564	435	133
971	Main	1999	22.774	15.502	729,244	4,237,495	440	134
977	Main	1999	22.779	15.492	729,237	4,237,477	441	134
983	Main	1999	22.784	15.483	729,229	4,237,460	442	135
995	Main	1999	22.794	15.465	729,215	4,237,427	445	136
999	Main	1999	22.797	15.458	729,210	4,237,414	445	136
740	Mott	1994	22.783	15.875	729,231	4,238,188	440	134
351	Short	1995	22.797	15.828	729,210	4,238,100	451	137
355	Short	1997	22.802	15.826	729,203	4,238,097	450	137
360	Short	1998	22.794	15.814	729,215	4,238,074	453	138
361	Short	1997	22.822	15.821	729,174	4,238,087	450	137
367	Short	1997	22.834	15.818	729,157	4,238,082	450	137
373	Short	1997	22.847	15.812	729,138	4,238,071	450	137
374	Short	1998	22.824	15.802	729,171	4,238,052	453	138
380	Short	1998	22.839	15.797	729,149	4,238,043	453	138
386	Short	1998	22.850	15.794	729,133	4,238,037	453	138
387	Short	1997	22.855	15.808	729,126	4,238,063	450	137
318	Station	1999	22.779	15.607	729,237	4,237,690	440	134
351	Station	1999	22.883	15.631	729,085	4,237,735	449	137